Analysing barriers to service improvement using a multi-level theory of innovation: the case of glaucoma outpatient clinics

Turner S, Vasilakis C, Utley M, Foster P, Kotecha A, Morris S and Fulop N

Abstract

The development and implementation of innovation by health care providers is understood as a multi-determinant and multi-lervel process. Theories at different analytical levels (i.e. micro and organisational) are needed to capture the processes that influence innovation by providers. This paper combines a micro theory of rinnovation, actor-network theory, with organisational level processes using the "resource based view of the firm". It examines the influence of, and interplay between, innovation-seeking teams (micro) and underlying organisational capabilities (meso) during the innovation process. We studied two service innovations in relation to ophthalmology services run by a specialist English NHS Trust at multiple locations. Using ethnographic methods, we conducted stakeholder interviews (28) and non-participant observation (40.5 hours) of outpatient clinics and meetings. Operational research techniques were used to support the ethnographic methods by mapping the care process in the existing and redesigned clinics. Deficiencies in organisational capabilities for supporting innovation were identified, including manager-clinician relations and organisation-wide resources. The paper concludes that actor-network theory can be combined with the resource-based view to highlight the influence of organisational capabilities on the management of innovation. Equally, actor-network theory helps to address the lack of theory in the resource-based view on the micro practices of implementing change.

Introduction

Following the 2008 financial crisis, many health systems are seeking ways to reduce the cost of care while improving service quality and population health (European Public Health Alliance, 2013; Berwick et al. 2008). In the English National Health Service (NHS), £22 billion needs to be saved by 2020 to meret the projected funding gap (Carter, 2015). To reduce cost while improving services, various innovation initiatives have been introduced, including the 'Quality, Innovation, Productivity and Prevention' (QIPP) programme to encourage innovation through service redesign (DH, 2011) and new organisational models of care (NHS England, 2014). Policymakers recognise that barriers to the implementation of innovation need to be addressed, including potential resistance to service innovations that disrupt existing practices (DH, 2012). Internationally, the Institute for Healthcare Improvement's 'Triple Aim' programme aims to improve health, care and cost, but many of the 141 organisations enrolled have found pursuing all three aims challenging (Whittington et al., 2015).

These challenges echo those found in the health care innovations literature on barriers and facilitators to service improvement. Multiple processes influence organisations' receptivity to innovation, including: clinical engagement (Evans-Lacko et al. 2010); quality and coherence of local policy, sources of leadership, environmental pressure, organisational culture and history, relations between management and clinicians (Pettigrew et al., 1992); and availability resources for change (Kaplan et al., 2010). There is consensus that innovation is both a multi-determinate and multi-layered process (Williams, 2011), with the implication that multi-level approaches are needed to study its implementation. However, little is known about the ways in which innovations are influenced by processes at different organisational levels (e.g. managerial and service level), and how the interplay between levels affect their implementation.

The aim of this paper is to examine the relevance of multi-level approaches in identifying, and accounting for, barriers and facilitators to the adoption and implementation of health care innovations. It addresses two research questions: 1. What is the role of theories at different organisational levels, the "resource based view of the firm" (RBV) (meso level) and actor-network theory (ANT) (micro level), in understanding barriers and facilitators to innovations? 2. What is the contribution of operational research to ethnographic methods in analysing the adoption and implementation of innovations? We analyse innovation processes through two service improvement projects that aimed to improve resource use within glaucoma outpatient clinics provided by a specialist English NHS Trust at multiple sites in a large city and surrounding region. The improvement projects were studied using ethnographic methods augmented by operational research methods. Ethnography was used to examine the development and implementation of the innovations, including barriers and facilitators. Operational research was used to map the care process for existing and redesigned clinics.

To study improvement at the micro (service) level, ANT is used which suggests that innovation involves aligning actors, both social (e.g. professional groups) and material (e.g. technologies), to form a network or system of relations that mobilises the innovation (Callon, 1991). This is combined with RBV, a meso (organisational) level theory, which suggests that innovation is influenced by an organisation's internal resources (Barney, 1991) and the managerial strategies used to combine or leverage these (Grant, 1998). We combine the meso level theory of RBV with the micro level theory of ANT because each perspective on innovation has been criticised for neglecting processes at other levels. RBV focusses on the resources firms possess rather than the practices through which they are applied (Kraaijenbrink et al., 2010), while ANT focusses on practices of innovation but neglects pre-existing structural influences (e.g.

organisational resources) on those practices (Cresswell et al., 2011).

Using ANT to describe innovation processes

Health care improvement can be defined as changes that enable better patient outcomes, system performance, and staff development (Batalden and Davidoff, 2007). However, improvement activities may not improve all aspects of services (e.g. patient outcomes might improve, while staff development declines). Thus, use of the term needs to be understood with regard to improvement 'in what' and 'for whom', as perceptions of improvement activities are likely to influence stakeholders' responses. The concepts of diffusion of innovations (Rogers, 1995), and ANT in particular, take into consideration stakeholders' responses to innovation and processes of aligning these to enable service improvement (or understanding why barriers may persist).

ANT is an influential way of conceptualising innovation processes that involve interplay between technology use and social practice (Latour, 2005; Greenhalgh and Stones, 2010). Innovation is seen as a social practice that involves influencing others; Callon (1991) uses the term 'translation' to describe the negotiated process of establishing a network, which includes defining a problem to address, establishing roles and relationships, and mobilising spokespersons to support change. Innovations are provisional as they rely on this network of relations holding together; consequently, some are relatively stable and become established practice, while others are more precarious and subject to change. In contrast with Rogers' (1995) work which privileges the role of individuals (e.g. opinion leaders) in the adoption of innovations, ANT focuses on the alignment of a network of relations, both social and material, to enable innovation. ANT is distinctive in claiming that technologies and other material artefacts also possess 'agency' and can thereby shape professional roles and relationships

during the implementation of innovation.

Studies of innovation based on ANT have been subject to criticism. First, although ANT describes how relationships between actors change during the innovation process, it seldom offers explanations as to why (Cresswell *et al.*, 2011). Second, accounts of innovation using ANT often rely on textual or 'thick description' (Geertz, 2003) of change processes with the consequent neglect of other representation methods e.g. visual media (Pink, 2003). Third, ANT studies can neglect the different histories and asymmetric power of the actors found in a given context (Cresswell *et al.*, 2011), including institutional power (Greenhalgh and Stones, 2010). The ontological position of ANT – that actors' relations and power are not pre-given, but produced in practice – means that features of the pre-existing context in which actor-networks develop are often neglected.

In keeping with others (Cresswell et al, 2011; Greenhalgh and Stones, 2010), we combine the micro level perspective of ANT with other conceptual lenses to *describe* more clearly 'how' innovations are developed and implemented in particular contexts and to *explain* 'why' those contexts influenced their implementation. To augment the description of innovation processes, we draw on techniques from operational research, also referred to as systems modelling and simulation, that have broad application to healthcare problems (AuthorsB). In relation to the two innovations, we mapped the care process in outpatient clinics to represent visually the changes to outpatient services proposed through innovation activities. To explain why particular innovations are (or are not) implemented, we suggest that ANT's focus on the dynamic interplay between social and technical change can be combined with analysis of organisations' innovation capabilities, using RBV.

The role of organisational processes in service innovation

RBV suggests that firms possess different types of resources: physical capital (e.g. technology), human capital (e.g. expertise), and organisational capital (e.g. coordinating systems) (Barney, 1991). It is argued that differences among organisations stem from variation in their managerial capabilities or know-how in combining these resources to enable competitive advantage (Grant, 1998). Managerial expertise is needed to develop strategies for combining resources that are likely to improve the organisation's efficiency or effectiveness (Barney, 1991). In relation to innovation, a key concept is 'organisational ambidexterity' or the ability to combine the exploitation of existing capabilities to deliver day-to-day operations with exploring new opportunities or producing innovation in response to a changing environment (Ferlie et al., 2015).

In health care, the specific capabilities for enabling innovation are likely to differ from other contexts. Relative to the private sector's focus on financial performance (where RBV was developed), health care managers need to take into account a wider range of factors when considering innovation. Managers need to respond to contextual factors associated with the professionalized and externally regulated environment of health care, both internal (e.g. multiple professional groups with specific expertise and interests) and external (e.g. shifting policy levers, demand and demographic change, new technologies) (Burton and Rycroft Malone, 2014).

Applying RBV to the health care context, Crilly et al. (2013) suggest a number of strategic resources are needed to enable innovation, including mobilisation of professional expertise, supporting knowledge sharing, and providing resources for the development and implementation of innovations (e.g. slack). These resources overlap with, and draw considerably on, those identified by the strategic change literature, e.g. features of the 'inner'

organisational context that influence receptiveness to innovation (Pettigrew et al. 1992). RBV adds to existing literature by highlighting the role of health care managers in identifying key resources and ensuring their organisation is able to exploit those resources. Drawing on Crilly et al.'s (2013) review, and related concepts from the strategic change literature (Pettigrew et al. 1992), we examine the role of three strategic resources in contributing to innovation: professional roles and relationships, managerial-clinical relations, and resources for innovation.

In addition to being identified in existing reviews, these resources were selected because of their empirical relevance to service innovation for outpatient clinics, which affects the roles and relationships of multiple professional groups staffing clinics; necessitates involvement of clinical and managerial stakeholders during planning and implementation; and is organisationally complex involving the use of multiple technologies (e.g. diagnostic equipment) and time/resources to make changes. The RBV concept of ambidexiterity is relevant because of the Trust's need to meet current demand for glaucoma outpatient appointments across its sites (exploitation) while pursuing service innovation (exploration) to improve clinic resource use.

Professional roles and relationships

As health care provision relies on many professions, a key organisational capability is leveraging this expertise by managing professional roles and relationships effectively. Studies of innovation adoption within the NHS highlight the importance of interactions between stakeholders which are, in turn, shaped by power and politics, social influence, and professionalism (Robert et al., 2010). There may be resistance to innovations that challenge existing expertise (Mork et al., 2010) or professional status (Powell and Davies, 2012). Inter-

professional relations are influenced by the organisational context; inter-professional trust can contribute to adoption of service innovation (Fitzgerald et al., 2002).

Managerial and clinical relations

Receptivity to innovation is influenced by organisations' capabilities in managing relations between management and clinicians (Pettigrew et al., 1992; Greenhalgh et al., 2004). Such relations are often characterised in terms of conflict (Numerato et al., 2012). 'Internal' or 'external' boundary spanning activity, e.g. 'knowledge brokering' (Waring et al., 2013), may be used to support innovation by encouraging collaboration across managerial and professional boundaries (Evans and Scarborough, 2014).

Organisational resources for innovation

Organisational resources are needed to support the planning and implementation of innovation. Implementation is more likely when the innovation is advocated internally, it receives dedicated time and resources, and improvements are evaluated (Greenhalgh et al., 2004). Williams (2011) describes the need for an organisation-wide 'innovation infrastructure' to provide leadership and resources for innovation projects. RBV highlights the preceding step required by managers of identifying the capabilities to enhance organisational performance, including priorities for innovation, and allocating resources to support capability development.

In summary, the health care innovation literature suggests that a number of organisational processes influence the receptiveness of a given context to innovation. We suggest that RBV adds to this literature by, firstly, identifying health care management as one way of influencing these processes by mobilising strategic resources and, secondly, elucidating potential trade-offs facing managers between exploiting existing capabilities and pursuing innovation, using the concept of organisational ambidexterity. RBV may contribute to micro level studies of

innovation, such as ANT, by explaining why the alignment of actors to enable particular innovations was achieved (or thwarted) due to organisational context. ANT augments RBV by examining how managerial strategies are translated into practice by staff at different organisational levels. While theories of innovation that address organisational factors have grown, this paper addresses a gap in the literature for studies that capture the multi-level nature of innovation within organisations, namely the interplay between managerial actions that shape the development of innovation and service level responses that influence its implementation. This approach adds to work on combining concepts to study innovations at multiple levels (AuthorsA).

Study context and methods

This study was conducted within the ophthalmology service of a specialist NHS Trust hospital. This Trust was chosen because it is a highly specialised, internationally renowned, centre for eye services, research and teaching which provides a 'research-led' context for studying the adoption and implementation of innovations. The organisation provides over 470,000 outpatient appointments per year at multiple sites across a large metropolitan area and surrounding region through an extended network of clinics, a novel type of organisational model that is attracting policy interest nationally (NHS England, 2014). We focussed on outpatient services for the chronic eye disease of glaucoma. Referrals to hospital for suspected glaucoma have been increasing annually due to population ageing and introduction of national guidance lowering the clinical threshold for referral. Increasing demand places pressure on hospital eye services; delays nationally in glaucoma follow-up appointments have caused harm (National Patient Safety Agency, 2009).

An organisation-wide improvement programme aimed to improve patients' experiences, which included reducing patient journey times through glaucoma clinics. Fieldwork was conducted

in 2013-4. To analyse existing services and innovation, we combined ethnography and operational research methods. Semi-structured interviews were conducted with senior managers (2), service-level managers (5), consultant ophthalmologists (4), other doctors (4), optometrists (3), nursing staff (2), assistant clinic staff (4), external consultants (3), and a glaucoma charity (1). A topic guide covered: perceptions of existing clinics, drivers for change, innovation in clinics and impact, key actors in leading innovation, and organisational receptivity. The interviews were used to inform and iteratively develop the process maps.

Non-participant observations (40.5 hours) covered four outpatient clinics, three service and executive level meetings for the redesigned clinics, and planning meetings for the remote review clinic. A social scientist and an operational researcher conducted most interviews and observations together. All observations were recorded contemporaneously in field journals kept by the researchers and typed up the same day. The social scientist focussed on barriers and facilitators to the development and implementation of innovation, while the operational researcher focussed on understanding the organisation of clinics through process mapping (Trebble et al. 2010).

The interview transcripts and observation notes were analysed thematically using inductive and deductive methods (Bradley et al., 2007): data were categorised using an initial set of codes (e.g. factors likely to support or constrain implementation of innovations) drawn from the study's research questions, topic guide, and innovations literature. Themes were developed and refined iteratively as patterns were identified in the empirical data and emerging themes (e.g. implementation influenced by interplay between processes at multiple organisational levels) were cross-referenced with the existing literature. Process maps, which represented both existing and planned care processes in different outpatient clinics, were developed through clinic observation and stakeholder discussions.

Organisation of existing and redesigned outpatient clinics

Process mapping revealed standard consultant-led outpatient clinics incorporated new referrals for suspected glaucoma, post-operative follow-up in the weeks immediately after an operation, and routine monitoring and longer-term follow-up for all glaucoma patients allocated to the consultant (Figure 1).

The first innovation was undertaken with the support of an external management consultancy and was intended to improve patient flow and redesign staff roles within existing clinics (the involvement of the research team did not influence the choice and design of either innovation). With the support of the management consultants, a multi-professional group from the hospital was established to reflect on the purpose and delivery of existing clinics and experiment with redesigned work processes to improve resource use and reduce patient journey times (Figure 2). The innovation work with the management consultancy was not rolled-out to other glaucoma clinics provided by the Trust because of staff concerns about training and use of medical expertise and operational capacity issues, including team availability to participate in the intervention.

The second innovation involved the planning and development of a pilot 'virtual' or 'remote review' clinic for stable glaucoma patients. It aimed to alleviate pressure on services caused by increasing demand. The pilot was first proposed by a small group of clinicians within the hospital; external contractors were employed to provide technological support. Patients attend the 'remote review' clinic, and undergo diagnostic tests performed by ophthalmic technicians, with results subsequently reviewed on a computer screen by a consultant ophthalmologist, who makes treatment decisions (Figure 3). Due to technical and organisational barriers, including difficulties with allocating stable patients to the clinics and staffing (AuthorsC),

implementation of the remote review clinic was delayed by approximately 18 months and clinics did not run at full capacity.

The next section explains why the Trust has found it difficult to implement innovation across its outpatient glaucoma clinics. In the discussion, those insights are used to reflect on barriers and enablers to implementing innovation among health care providers.

Analysing innovation processes by combining organisational capabilities and ANT

Professional roles and relationships

RBV highlights the importance of harnessing professional knowledge and expertise. Our observations suggested that there was difficulty aligning different professional groups with the flow of patients within standard outpatient clinics. Firstly, aligning the working hours of multi-professional staff so that they coincided with the start and end of clinics was problematic because different professional groups fell under different managerial lines of authority: *'people that work in my clinic are not under my direct control'* (ophthalmologist). Secondly, matching up patient flows with the diagnostic equipment within the clinics was challenging. A clerk told us that post-operative and post-laser patients were allocated the first appointment time within the clinic as *'standard procedure'*, but then had to queue for other medical equipment, e.g. the optical coherence tomography [OCT] machine, *'which sets the tone for the clinic'*. Thirdly, demand pressures made it difficult to develop and apply clinical expertise. As a trainee consultant stated, pressure to process patients quickly could stifle dialogue with the consultant and impact negatively on training: *'because I know how late the clinic runs I will try to minimise my questions'*. Strain on existing resources made it difficult to use clinical expertise effectively (e.g. involving consultant where patient discharge decision needed), contributing to further pressure. There was a lack of fit between organisational structures and emerging technologies of care. Structures were still organised into professional 'silos' reflecting the

occupational division of labour, while the provision of clinics and use of technologies for diagnosing disease demanded inter-professional coordination.

In both improvement projects, changes to professional roles within clinics aimed to change the way clinical expertise was used. However, attitudes toward the allocation of new roles varied across the multi-professional teams staffing the clinics. In the management consultant assisted redesign of clinics, a 'coordinator' role was introduced in which a nurse matched patients with their pre-allocated clinician and monitored progress of each appointment. Some members of other professional groups did not view this monitoring aspect of the role favourably. An optometrist suggested that nurses were underutilised in this new role:

'if we are all working really, really hard and rushing around and they [coordinators] are just standing around it kind of causes a bit of tension because we feel like we are killing ourselves and they are just standing giving out notes'.

A doctor within the same clinic raised concerns about the new approach in which doctors now dealt with all aspects of a patient's treatment, rather than tasks being subdivided among the team according to clinical expertise: *'it's quite time consuming for me, so as the doctor I would be there taking the visions, taking the pressure, doing the whole investigation which I wouldn't otherwise do. Now, I'm by no means saying I'm above that, but the reason that there's a hierarchy in the clinic is because our time is more valuable just as a consultant's time is more valuable than mine'*.

Where patients were pre-allocated to named clinicians based on their perceived level of expertise, some clinicians expressed concerns about receiving a less diverse case mix:

'we're seeing the same patients over and over and it's always "stable's" and "new's" which is fine because we can cope with that but you're not really learning anymore' (optometrist).

In the ‘remote review’ clinic, there were significant changes to the typical roles of both consultants and technicians. A trainee ophthalmologist expressed reservations about the prospect of reviewing patients’ diagnostic data using a computer and other ‘management’ activities to the neglect, potentially, of training others and meeting patients face-to-face:

‘what is that consultant not going to be doing because he’s analysing data, I mean that’s the question. We have had people pulled out of clinics to go upstairs and do management or whatever where to my mind they would be more useful actually being there teaching, supervising and seeing their patients’.

In the ‘remote review’ clinics, technicians conduct diagnostic tests face-to-face with each patient in accordance with their appointment time, rather than performing one role within a wider multidisciplinary team in consultant-run clinics. While positive overall about the reduced waiting time for patients in ‘streamlined’ clinics, a technician expressed some concern about the pressure to test patients in the allotted time which made it more difficult to discuss work: ‘*sometimes you want to talk to your colleague – not personal, just for a patient*’.

In summary, implementation of new professional roles within outpatient clinics affected a range of staff at the service level, from consultants through to lower ranked staff. In the clinic redesign project, an expanded ‘coordinator’ role for some nursing staff was introduced, although this change was met with resistance from other professional groups (i.e. among doctors and optometrists who perceived that nurses were undertaking less clinical work, while also engaging more in the regulation of their work). Similarly, the introduction of the ‘remote review’ clinic highlighted how changes in technology use altered a range of roles and relationships within multi-professional teams, generating concerns from some technicians and consultants. However, the ‘pilot’ status of the improvement work meant that learning did take

place in response to the staffing issues (e.g. new consultant contracts included remote review monitoring).

The innovations had consequences for social and technological aspects of work. New roles resulting from implementation of the innovations interfered with the clinic's 'hierarchy' because standard clinics reflected medicine's division of labour, based on perceived differences in specialisation and skill. In keeping with RBV, managers aimed to reorganise services to leverage valuable resources (i.e. professional expertise), but the implementation of change encountered clinical resistance because it challenged the medical hierarchy. Moreover, while the redesigned clinics aimed to reduce patient journey time, there were knock-on effects for staff, including concerns about use of their clinical expertise and training opportunities. With its emphasis on network alignment, ANT highlighted barriers to implementation: the medical hierarchy could be considered a strong, established network that was resistant to the 'translation' process of improvement as this aimed to change professional roles. RBV recognises that social processes influence technology use, but does not consider how technologies can influence social practice because they are understood as (imitable) resources that organisations control. ANT differs from RBV in treating human and material actors symmetrically, thereby drawing attention to the ways in which technologies influence social practice, and vice versa. Thus, ANT highlights how implementing change was affected by the impact of technology on social practices of work (e.g. the 'remote review' clinic met resistance from technicians because it reduced their opportunities to discuss their work).

Organisational resources for innovation

RBV suggests that resources (e.g. slack) are needed to support innovation, and in particular organisations' ability to combine exploitation and exploration. Within the Trust, the

organisational strain caused by the capacity issues in standard clinics created a context in which it was difficult to implement new services to alleviate the pre-existing capacity problems. A service manager explained that they sometimes struggled to balance the need in their role to respond to issues associated with existing operations while simultaneously pursuing the implementation of service improvements:

'*A major problem for operational managers in the NHS […] is the fact that you really, really want to improve the service, but you just find that you end up doing too much fire fighting, and you end up focusing on far too many very short term problems and don't feel that you have the head space or capacity you would like to make the real sustainable improvements*'.

The use of dedicated resources, both staff and physical infrastructure, was seen as a way of facilitating service improvement given the demands of day-to-day work. As well as requiring staff time, improvement was perceived to be more likely in new clinical spaces. In relation to the 'remote review' clinic, introducing changes to working practices within a new space was regarded as a more straightforward way of breaking established routines:

'one of the things that makes it easier to change working practices is starting up a new venture. So if you start something new and you're either redeploying staff from their original role or taking on new staff, you're then starting with a clean sheet' (ophthalmologist).

However, maintaining resources over time for service improvement was problematic in the face of competing priorities. In the service redesign project, some clinicians were pulled away to meet ongoing operational demands despite being promised the space to engage in service improvement: *'what you had was a team that were trying to do change, but the hierarchy were still asking them to report on all the stuff they used to do before, so then you had a conflicted team'* (middle manager).

In relation to the 'remove review' clinic, assembling the physical infrastructure required to get the clinic up and running was challenging. The space needed for testing equipment was not always available to the project team, as one member explained: *'they haven't had access to [space] because there's so much bureaucracy. We have a space committee that tells us when we can use the space, which is empty half the time, and it's stuff like that which just drags and kills you'*. There did not appear to be a formal organisational structure for supporting the development and potential implementation of new ideas: *'There is no formal structure to say we have an idea, we will go to this person, or we'll have a meeting with this group of people to help us'*.

In summary, freedom from the pressure of day-to-day operations, in terms of both time and space, was perceived important by managers and clinicians in supporting improvement. In the clinic redesign project, the improvement work appeared to enable learning that would not have been possible without this stimulus, given the strained environment in which outpatient clinics were run which left little time for planning or reflection. Similarly, the 'remote review' clinic was established as a 'new venture' to work around existing professional norms and enable new roles to be introduced. ANT is useful in highlighting how this approach to introducing change may be easier to implement because it avoids established norms associated with 'old' ways of working. The creation of a new venture, with associated time and space, appeared to make clinicians and managers more receptive to engaging with new approaches to delivering clinics. In keeping with RBV, availability of slack resources was necessary for staff to pursue innovation as delivery of standard clinics (exploitation) was pressured and time consuming. However, the planning and implementation of both improvement projects was constrained by the wider organisational context, as resources for pursuing or sustaining improvement efforts were difficult to acquire or maintain over time.

Managerial-clinical relations

According to RBV, organisations need to enable the coordination (e.g. knowledge sharing) of different groups (Barney, 1991); relations between managers and clinicians are key in health services innovation (Pettigrew et al. 1992). In the planning of service improvement, there were tensions between managers and clinicians. One ophthalmologist suggested that managers at the hospital were the limiting factor when it came to improving services:

'the consultants have done everything possible to work with the management but you saw what sort of answers we get, they come to our consultant meetings now, our service meetings, with promises to come back to us on this, come back to us on that, I don't see anything'.

For their part, managers could find it difficult to challenge consultants' authority, which was based on clinical expertise, during decision-making processes: *'I can't tell [an ophthalmology] consultant they're not right, clinically, I can't question their clinical views, because I'm not a clinician'* (service manager). Although differences in opinion were readily expressed and mutually recognised, they often remained unresolved, as a senior manager stated:

'we're a very consensual organisation. We don't do confrontation well. You can be having a conversation with somebody and you may be fundamentally at variance with what they want and you want, not saying anybody's right or wrong but what you both want is fundamentally different and you don't really address the issue'.

In relation to the redesigned clinics, a series of meetings was held between the management consultants and clinical and managerial staff to inform a board level decision about adopting the approach more widely across the Trust's sites. These meetings indicated that views on the improvement activity differed among representatives of different professional groups. We observed a clinical governance meeting in which a hospital manager gave an overview of its rationale and some preliminary data showing a reduction in average patient journey time in one of the clinics. During questions from the audience, a trainee ophthalmologist asked *'what does*

success look like?' – did this mean saving money or improving patient experience – while a technician stated that patients were not as happy as suggested because they *'see us and have a go, but are nice to doctors'*.

At a subsequent feedback meeting, the approach taken of pre-allocating patients according to the clinical team's skill mix was summarised during a PowerPoint presentation. In response, one consultant mutters *'very original idea'* in a sarcastic tone. Another consultant suggested that the problem is the overbooking of clinics and that, only once patient numbers are down, is it appropriate to enter into any work redesigning the clinics. Moreover, increasing the capacity of clinics was an issue *'management should be addressing'*.

In summary, there were disagreements between managers and clinicians concerning both the objectives of undertaking service improvement activity and where responsibility for planning and implementing innovation lay. Senior clinicians were engaged in the improvement processes, but ongoing dialogue between the two groups did not produce agreement about how services should change or what progress looked like. Giving both improvement projects 'pilot' status afforded some freedom to redesign clinics, but also appeared to reflect indecisiveness about how services should be delivered, and postponed the need for all stakeholders to agree on adopting change at a broader scale. Thus, the findings indicate practical difficulties with coordinating different groups to enable innovation, as suggested by RBV. Furthermore, there may be tensions between investing in different types of resources (e.g. encouraging specialisation around clinical expertise may be at odds with improving knowledge sharing among clinical and managerial groups, where the latter aims to influence how expertise is applied in different types of clinics). From an ANT perspective, the implementation of improvements was thwarted by the difficulty of aligning the interests of different clinical and managerial groups.

Discussion

This paper identified barriers to implementing innovations through the redesign of glaucoma outpatient clinics across a specialist Trust's clinics. The first three barriers were associated with the Trust's organisational capabilities to support the development of innovation. Firstly, there was a lack of an organisation-wide support structure for undertaking innovation and difficulties with sustaining the allocation of resources for improvement activity (e.g. staff being recalled to support service delivery). Secondly, disagreements between managers and clinicians on the purpose of service innovation, and who was responsible for its implementation, delayed decisions about rolling-out changes to services more widely. Thirdly, the strain caused by the capacity issues appeared to create a context in which it was difficult to reflect upon or implement new services that might alleviate the original capacity problems. Other barriers related to the implementation of innovation at the micro service level. Redesigning clinics caused some resistance from clinicians, especially where this interfered with approaches to clinical work, training opportunities, and the perceived hierarchy of professional expertise within the clinic.

This paper contributes methodologically and empirically to the literature on innovation in health care organisations. It shows empirically how multi-level organisational processes shape innovation processes and that they exhibit important interdependencies. Weiner (2009) has called for research that examines the relationship between organisational factors and their influence on performance. By allowing different factors to be considered together as capabilities which can be influenced by strategic management, RBV provides an overarching frame for bringing together disparate factors from the health care innovation literature and analysing their influence on organisational performance. For example, a lack of organisational resources can place pressure on professional roles and relationships and managerial-clinical

relations. In relation to the health care innovation literature, the findings confirm that managerial capabilities (e.g. the quality of clinical-managerial relations and availability of slack resources) are needed to support the development of innovation. ANT shows that implementation processes are influenced by staff responses to innovation at the service level. The findings contribute to existing literature by highlighting the interplay between processes at multiple organisational levels: progress with service level innovations (e.g. those 'championed' by clinicians) are enabled or hindered by wider managerial capabilities; equally, innovation capabilities cannot be developed without considering service level implementation (e.g. attending to the complexity of the socio-technical context of service delivery, including professional responses to change).

The findings suggest that innovation involves interaction between the practices of innovation-seeking teams and established capabilities within provider organisations. These interactions might be different for emergent innovations (e.g. led by innovation-seeking clinicians) and those that are externally proposed. In our study, the externally proposed innovation (redesigning existing clinics) had senior management support and visibility at this level, allowing it to attract significant organisational resources and move forwards initially. However, enrolling managers and clinicians at the service level beyond those involved originally encountered difficulties as the approach was rolled out more widely. The emergent innovation ('remote review' clinic) relied more on entrepreneurial activity by the clinicians to assemble organisational resources, causing delays as ongoing negotiation was needed to put these into place. It might be suggested that the adoption of innovations would be aided by prominent 'champions' (Rogers, 1995); however, our findings suggested that the multi-disciplinary context in which the changes to practice were being proposed, meant that advocates representing clinical and managerial groups at different levels would be needed to support the

innovation, thus demanding multiple intermediaries to hold the new network together.

ANT's emphasis on processes of aligning actors to produce innovation at the micro level, can be enriched analytically as an explanation of innovation by referring to pre-existing organisational capabilities that help to determine (i.e. constrain or enable) the translation processes described by ANT. We add to current literature which suggests that pre-existing social structures influence the innovation practices described by ANT (Greenhalgh and Stones, 2010), by using RBV to highlight how organisational capabilities shape the planning and implementation of innovation at the micro or service level. Equally, ANT remains important in highlighting barriers to the mobilisation of capabilities. In health care, of particular note is the strained service level context, where staff at the micro level are involved in managing day-to-day the delivery of services, while simultaneously attempting to implement improvements.

By combining ethnography with operational research methods to present organisational processes visually, this study was able to map potential innovations and identify and examine barriers and facilitators to their adoption and implementation. Insights from operational research can benefit ethnographic research on innovations by providing a clear representation of the innovation, albeit one drawn from particular perspectives that ethnographic methods (e.g. observations, interviews) can help to elucidate. Much of the existing literature looks at barriers and enablers to implementing innovations, yet the attributes of such innovations as complex interventions are often ill defined (Richards, 2015) and analysis of these relies heavily on written description based on the authors' interpretation (Hammersley, 1992). While process maps are equally constructed, they do prompt researchers to reflect on the steps involved in a new or existing process of care that can help to ground written accounts of innovation.

Equally, ethnographic research can contribute to the development of process flow diagrams within operational research by highlighting contextual factors that influence implementation, drawing on socio-technical analysis found in ANT. Findings from the qualitative research could be used to add staff perspectives to the process of care within new approaches to outpatient clinics. In the redesigned clinic (Figure 2), staff views on the pre-allocation of patients by the nurse coordinator could be added (including consideration of how this fits with the medical hierarchy) and staff training implications due to the narrower case mix. In the remote review clinics (Figure 3), the arrows representing patient flow through the clinic could be annotated to include staff perspectives (e.g. technicians' value talk about work during handoffs but the flow of patients limits this).

In conclusion, organisational processes remain relevant as barriers to innovation within health care provider organisations, despite policy emphasis on encouraging innovation at this level. In particular, increasing demand for services related to chronic disease that place a strain on service delivery may undermine providers' capacity to improve services. Insight from RBV suggests that health care managers need an environment that supports organisational ambidexterity (combining exploitation and exploration), although this approach will need to buck the trend for austerity as making radical improvements requires space for relection and organisational resources. RBV's top-down perspective, which focuses on how managers enable resources to be combined to create capabilities, could be complemented by taking into account how innovation capabilities are received by and support front-line staff, especially where operational pressures also need to be managed; these insights could be used to inform local discussions about what developing capabilities means to different staff groups.

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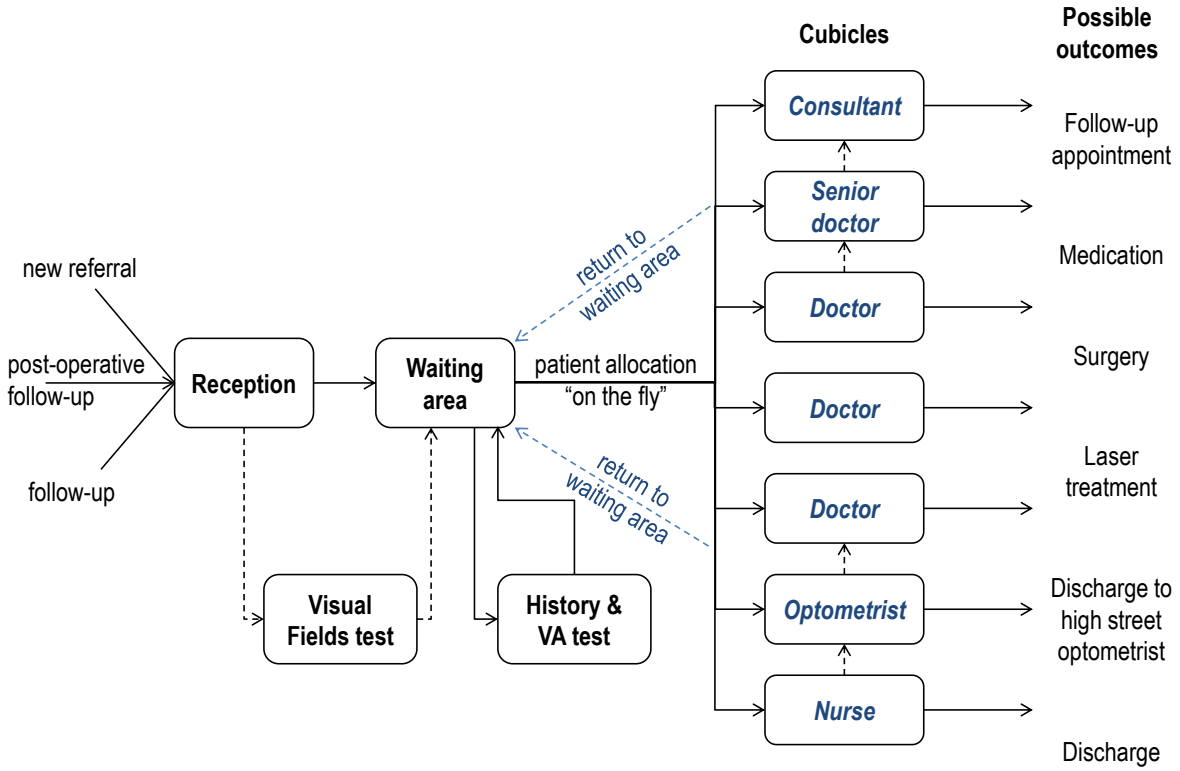

Figure 1. Process of care and patient flows in a typical glaucoma outpatient clinic. Possible outcomes listed on the right hand side are indicative and not exhaustive. Multiple outcomes are possible (and typical) after a signle patient visit, e.g., "follow-up appointment" and a "Medication" prescription. (VA: Visual Acuity)

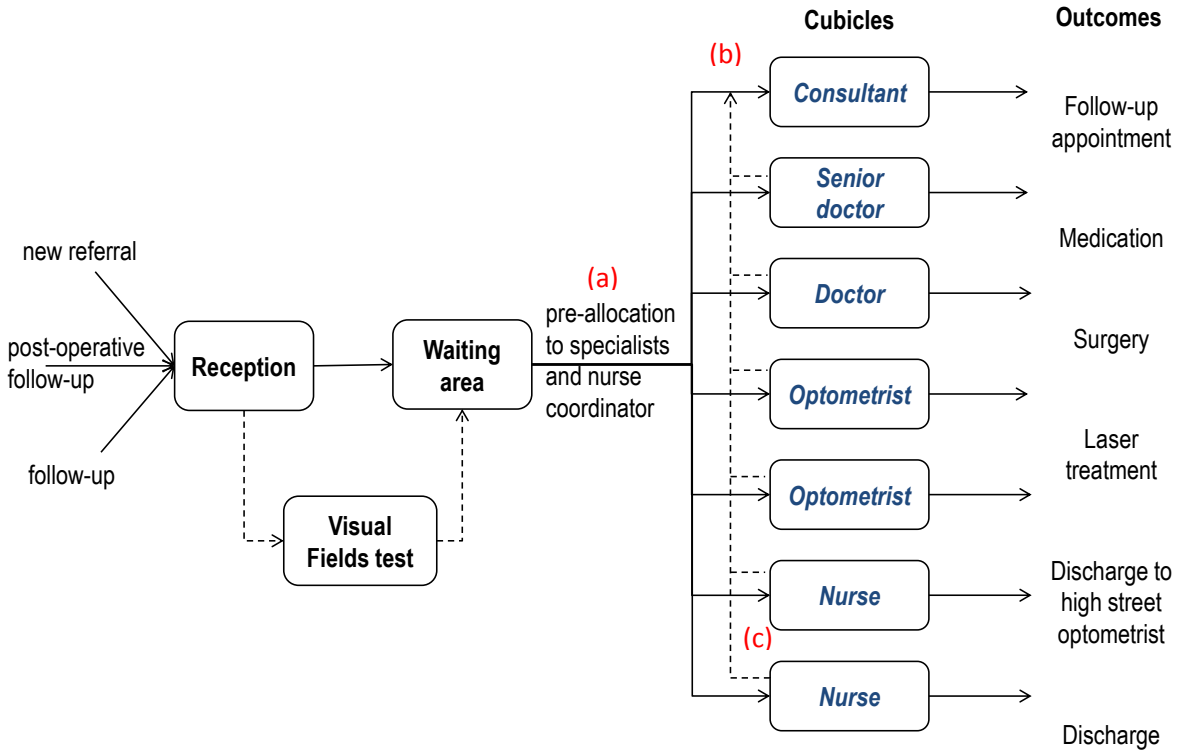

Figure 2. Process of care and patient flows in a redesigned glaucoma outpatient clinic. Changes included (a) pre-allocation of patients to specialists by the lead consultant; (b) no or very few patients allocated to the lead consultant who was thus able to spend time in different cubicles as-and-when needed; and (c) 'single-piece' flow through the clinic, whereby the patient had the history taken and all the tests done by a single specialist without the need to return to the waiting area once the process of care had started.

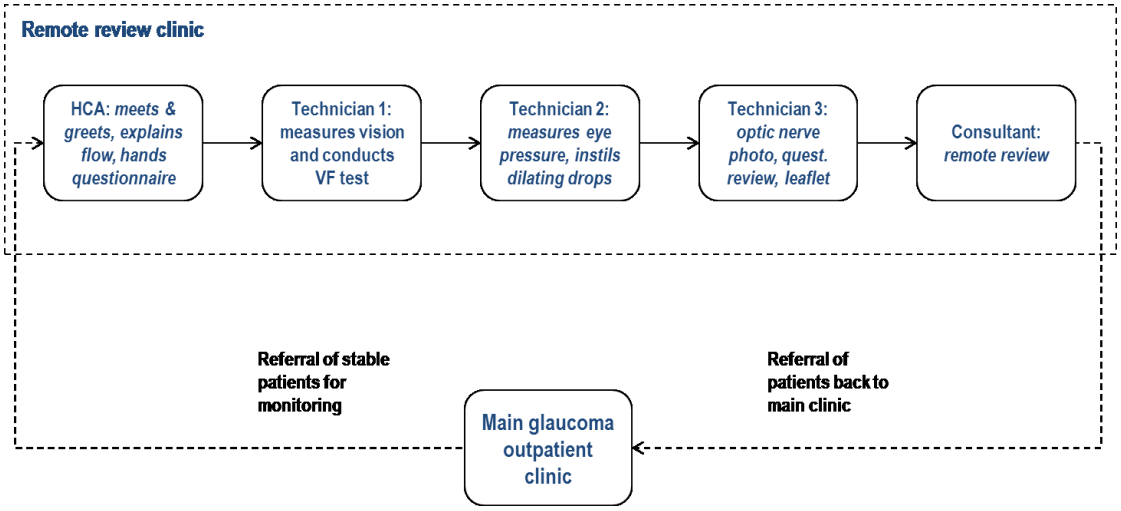

Figure 3. Process of care and patient flows in remote review outpatient clinic. Diagnostic data collected via the clinic's ophthalmic instruments (e.g. the tonometer for checking intraocular pressure) are linked with the Trust's electronic patient record system, enabling the data to be reviewed at other times and locations.